Claims

1. A hydrotalcite-like substance produced by preparing a mixture of an acidic solution containing aluminum ions and magnesium ions and an alkaline solution containing alkali, and then subjecting the mixture to water removal or neutralization, without ageing, wherein said hydrotalcite-like substance has a crystallite size of 20nm or less.

2. The hydrotalcite-like substance according to claim 1, wherein said hydrotalcite-like substance has an average crystallite size of 10nm or less.

3. A hydrotalcite-like substance having a basal spacing , said basal spacing being 0.85 nm or more in a nitric acid type, while 0.78 nm or more in a carbonic acid type and a chlorine type.

4. A hydrotalcite-like substance, enabling simultaneous ion adsorption or ion exchange relative to anions under the co-presence of carbonate ions.

5. A process for producing a hydrotalcite-like substance, which comprises the steps of:

mixing an acidic solution containing aluminum ions and magnesium ions with an alkaline solution containing alkalis to produce a hydrotalcite-like substance; and

subjecting the hydrotalcite-like substance thus produced to water removal or neutralization process without ageing.

6. The process for producing a hydrotalcite-like substance according to claim 5, wherein a molar ratio of said aluminum ion to said magnesium ion is in a range of from 1:5 to 1:2.

7. The process for producing a hydrotalcite-like substance according to claim 5 or 6, wherein said acidic solution contains aluminum compound and/or magnesium compound that are/is not dissolved therein.

8. The process for producing a hydrotalcite-like substance according to any one of claims 5 to 7, wherein at least one selected from a group consisting of alumina, sodium aluminate, aluminum hydroxide, aluminum chloride, aluminum nitrate, bauxite, residue left after producing alumina from bauxite and aluminum sludge is used as an aluminum source of said aluminum ions.

9. The process for producing a hydrotalcite-like substance according to any one of claims 5 to 8, wherein at least one selected from a group consisting of brucite, magnesium chloride, magnesium hydroxide, magnesite and calcined magnesite is used as a magnesium source of said magnesium ions.

10. The process for producing a hydrotalcite-like substance according to any one of claims 5 to 9, wherein at least one selected from a group consisting of sodium

hydroxide, calcium hydroxide, lime and solidification material for cement is used as said alkalis.

11. The process for producing a hydrotalcite-like substance according to any one of claims 5 to 10, wherein neither said acidic solution nor said alkaline solution contains carbonate ions.

12. The process for producing a hydrotalcite-like substance according to any one of claims 5 to 11, wherein said acidic solution is mixed with said alkaline solution at 100 degrees C or lower.

13. A process for immobilizing a hazardous substance, which comprises the step of adding a hydrotalcite-like substance to an object to be immobilized in a manner that the synthesis of the hydrotalcite-like substance occurs directly on the object to be immobilized through the mixing of an acidic solution containing aluminum ions and magnesium ions with an alkaline solution containing alkalis, and then subjecting the same to water removal process or neutralization process.

14. The process for immobilizing a hazardous substance, according to claim 13, wherein said hydrotalcite-like substance is added to the object to be immobilized after adding alkalis to the object.

15. A process for immobilizing a hazardous substance, comprising the step of adding to an object to be immobilized an acidic solution containing aluminum ions and magnesium ions, while mixing with alkalis.

16. The process for immobilizing a hazardous substance according to any one of claims 13 to 15, wherein a molar ratio of said aluminum ions to said magnesium ions is in a range of from 1:5 to 1:2.

17. The process for immobilizing a hazardous substance according to any one of claims 13 to 16, wherein said acidic solution contains aluminum compound and/or magnesium compound that are/is not dissolved therein.

18. The process for immobilizing a hazardous substance according to any one of claims 13 to 15, wherein at least one selected from a group consisting of alumina, sodium aluminate, aluminum hydroxide, aluminum chloride, aluminum nitrate, bauxite, residue left after producing alumina from bauxite and aluminum sludge is used as an aluminum source of said aluminum ions.

19. The process for immobilizing a hazardous substance according to any one of claims 13 to 18, wherein at least one selected from a group consisting of brucite, magnesium chloride, magnesium hydroxide, magnesite and calcined magnesite is used as a magnesium source of said magnesium ions.

20. The process for immobilizing a hazardous substance according to any one of claims 13 to 19, wherein at least one selected from a group consisting of sodium hydroxide, calcium hydroxide, lime and solidification material for cement is used as said alkalis.

21. The process for immobilizing a hazardous substance according to any one of claims 13 or 14, wherein neither said acidic solution nor said alkaline solution contains carbonate ions.

22. The process for immobilizing a hazardous substance according to any one of claims 13 to 21, wherein zeolite and/or bentonite are/is used together with said hydrotalcite-like substance.

23. The process for immobilizing a hazardous substance according to claim 22, wherein the object to be immobilized is a contaminated soil polluted with a hazardous substance, wastes containing contaminated water or a hazardous substance, leachate thereof and the like, and said hydrotalcite-like substance is added to the contaminated soil or wastes together with zeolite and/or bentonite.

24. The process for immobilizing a hazardous substance according to claim 22, wherein said contaminated soil is covered with a filter layer of zeolite and/or bentonite, and another filter layer of said hydrotalcite-like substance.